

THAT WHICH IS CLAIMED IS:

1 1. An article of manufacture comprising a packaging material and a biocidal
2 composition contained within said packaging material, wherein said biocidal composition
3 consists essentially of (i) at least one 1,3-dibromo-5,5-dialkylhydantoin in which one of the
4 alkyl groups in the 5-position is a methyl group and the other alkyl group in the 5-position
5 contains in the range of 1 to 4 carbon atoms as the only biocidally-active ingredient(s) in said
6 composition, and (ii) optionally at least one biocidally-inactive ingredient; and wherein said
7 packaging material comprises at least a label suitably identifying the name of the product in
8 the package, and at least a sticker identifying the contents as being an oxidizing agent.

1 2. An article of manufacture of Claim 1 wherein said biocidal composition
2 contained within said packaging material contains at least one biocidally-inactive ingredient,
3 and wherein said label or another label associated with said packaging material indicates
4 hazards associated with the handling and use of the packaged composition.

1 3. An article of manufacture of Claim 2 wherein said at least one biocidally-
2 inactive ingredient comprises a binder or a manufacturing by-product, or both.

1 4. An article of manufacture of Claim 3 wherein said label or another label
2 associated with said packaging material indicates that the active ingredient of said biocidal
3 composition contained within said packaging material is the one or more of said 1,3-dibromo-
4 5,5-dialkylhydantoins actually contained therein.

1 5. An article of manufacture of Claim 4 wherein said label or another label
2 associated with said packaging material indicates the proportion or percentage of the one or
3 more 1,3-dibromo-5,5-dialkylhydantoins in the said biocidal composition contained in the
4 packaged composition.

1 6. An article of manufacture of Claim 5 wherein said label or another label
2 associated with said packaging material indicates the proportion or percentage of inactive
3 contents in the composition contained within said packaging material.

1 7. An article of manufacture of Claim 5 wherein said label or another label
2 associated with said packaging material include at least one of the following:

- 3 a) description of environmental hazards associated with discharge of the composition
4 into the environment;
- 5 b) description of physical and chemical hazards, and indications of how to avoid or at
6 least reduce such hazards in use;
- 7 c) advice on storage of the product, and on disposal of the product and containers;
- 8 d) advice concerning practical treatment and first aid to be used in the event of contact
9 of the composition with eyes or skin, or if the composition is ingested (swallowed) or
10 inhaled;
- 11 e) directions for use, including but not limited to dosage rates associated with specified
12 use patterns; and
- 13 f) EPA registration number, EPA establishment number, and name and address of the
14 registrant.

1 8. An article of manufacture of Claim 1 wherein said at least one 1,3-dibromo-
2 5,5-dialkylhydantoin is 1,3-dibromo-5-isobutyl-5-methylhydantoin, 1,3-dibromo-5-n-propyl-
3 5-methylhydantoin, or 1,3-dibromo-5-ethyl-5-methylhydantoin, and wherein said biocidal
4 composition contained within said packaging material contains at least one biocidally-inactive
5 ingredient which comprises a binder or a manufacturing by-product, or both.

1 9. An article of manufacture of Claim 1 wherein said at least one 1,3-dibromo-
2 5,5-dialkylhydantoin is a mixture of at least two of said 1,3-dibromo-5,5-dialkylhydantoins,
3 one of which is 1,3-dibromo-5,5-dimethylhydantoin, and wherein said biocidal composition

4 contained within said packaging material contains at least one biocidally-inactive ingredient
5 which comprises a binder or a manufacturing by-product, or both.

1 10. An article of manufacture of Claim 1 wherein said at least one 1,3-dibromo-
2 5,5-dialkylhydantoin is a mixture of 1,3-dibromo-5,5-dimethylhydantoin and 1,3-dibromo-5-
3 ethyl-5-methylhydantoin, and wherein said biocidal composition contained within said
4 packaging material contains at least one biocidally-inactive ingredient which comprises a
5 binder or a manufacturing by-product, or both,

1 11. An article of manufacture of Claim 1 wherein said at least one 1,3-dibromo-
2 5,5-dialkylhydantoin is 1,3-dibromo-5,5-dimethylhydantoin, and wherein said biocidal
3 composition contained within said packaging material contains at least one biocidally-inactive
4 ingredient which comprises a binder or a manufacturing by-product, or both,
5

1 12. An article of manufacture of any of Claims 8, 9, 10, or 11 wherein said label
2 or another label associated with said packaging material indicates hazards associated with the
3 handling and use of the packaged composition.

1 13. An article of manufacture of any of Claims 8, 9, 10, or 11 wherein said label
2 or another label associated with said packaging material indicates the proportion or percentage
3 of the 1,3-dibromo-5,5-dialkylhydantoin(s) in the biocidal composition contained in the
4 packaged composition, and the proportion or percentage of the biocidally-inactive ingredients
5 in the composition contained within said packaging material.

1 14. An article of manufacture of any of Claims 1, 4, 6, or 7 wherein at least 50 wt%
2 of said biocidal composition is said at least one 1,3-dibromo-5,5-dialkylhydantoin.

1 15. An article of manufacture of any of Claims 1, 4, 6, or 7 wherein at least 90 wt%
2 of said biocidal composition is said at least one 1,3-dibromo-5,5-dialkylhydantoin.

1 16. An article of manufacture comprising a packaging material and a biocidal
2 composition contained within said packaging material, wherein said biocidal composition
3 consists essentially of at least 95 wt% of one or more 1,3-dibromo-5,5-dialkylhydantoins in
4 which one of the alkyl groups in the 5-position is a methyl group and in which the other alkyl
5 group in the 5-position has in the range of 1 to 4 carbon atoms, with the balance, if any, to 100
6 wt% being inactive ingredient(s), wherein said packaging material comprises a label that
7 indicates that the product can be used as a biocide for wastewater, recirculating cooling water
8 systems, once-through cooling water systems, brewery pasteurizers, pulp and paper mill
9 systems, air washer systems, air and gas scrubber systems, or decorative fountains, or any two
10 or more of these, and wherein said label or another label associated with said packaging
11 material indicates that the dosage rate for at least one the foregoing eight uses or use patterns
12 is such as to maintain a residual bromine level of 0.5-5 ppm or as needed to maintain
13 biological control.

1 17. An article of manufacture of Claim 16 wherein said biocidal composition
2 consists essentially of at least 97 wt% of said one or more 1,3-dibromo-5,5-dialkylhydantoins,
3 wherein said inactive ingredient(s) comprise at least a binder or a manufacturing by-product,
4 or both, and wherein said packaging material further comprises a sticker identifying the
5 contents as being an oxidizing agent.

1 18. An article of manufacture of Claim 16 wherein said one or more 1,3-dibromo-
2 5,5-dialkylhydantoins are selected from the group consisting of 1,3-dibromo-5-isobutyl-5-
3 methylhydantoin, 1,3-dibromo-5-n-propyl-5-methylhydantoin, 1,3-dibromo-5-ethyl-5-
4 methylhydantoin, and mixtures of any two or all three thereof, wherein said inactive
5 ingredient(s) comprise at least a binder or a manufacturing by-product, or both, and wherein
6 said packaging material further comprises a sticker identifying the contents as being an
7 oxidizing agent.

1 19. An article of manufacture of Claim 16 wherein said one or more 1,3-dibromo-
2 5,5-dialkylhydantoins is 1,3-dibromo-5,5-dimethylhydantion, wherein said inactive
3 ingredient(s) comprise at least a binder or a manufacturing by-product, or both, and wherein
4 said packaging material further comprises a sticker identifying the contents as being an
5 oxidizing agent.

1 20. An article of manufacture comprising a packaging material and a biocidal
2 composition contained within said packaging material, wherein said biocidal composition
3 consists essentially of at least 95 wt% of one or more 1,3-dibromo-5,5-dialkylhydantoins in
4 which one of the alkyl groups in the 5-position is a methyl group and in which the other alkyl
5 group in the 5-position has in the range of 1 to 4 carbon atoms, with the balance, if any, to 100
6 wt% being inactive ingredient(s), wherein said packaging material comprises a label that
7 indicates that the product can be used by manufacturers in formulating biocides for
8 wastewater, recirculating cooling water systems, once-through cooling water systems, brewery
9 pasteurizers, recreational water, pulp and paper mill systems, air washer systems, air and gas
10 scrubber systems, decorative fountains, or hard surface sanitizers, or any two or more of these,
11 said recreational water being one or more of swimming pools, hot tubs, and spas, and wherein
12 said label or another label associated with said packaging material indicates that that
13 formulators using the product are responsible for EPA registration of their formulated
14 products.

1 21. An article of manufacture of Claim 20 wherein said biocidal composition
2 consists essentially of at least 97 wt% of said one or more 1,3-dibromo-5,5-dialkylhydantoins,
3 wherein said inactive ingredient(s) comprise at least a binder or a manufacturing by-product,
4 or both, and wherein said packaging material further comprises a sticker identifying the
5 contents as being an oxidizing agent.

1 22. An article of manufacture of Claim 20 wherein said one or more 1,3-dibromo-
2 5,5-dialkylhydantoins are selected from the group consisting of 1,3-dibromo-5-isobutyl-5-

3 methylhydantoin, 1,3-dibromo-5-n-propyl-5-methylhydantoin, 1,3-dibromo-5-ethyl-5-
4 methylhydantoin, and mixtures of any two or all three thereof, wherein said inactive
5 ingredient(s) comprise at least a binder or a manufacturing by-product, or both, and wherein
6 said packaging material further comprises a sticker identifying the contents as being an
7 oxidizing agent.

1 23. An article of manufacture of Claim 20 wherein said one or more 1,3-dibromo-
2 5,5-dialkylhydantoins is 1,3-dibromo-5,5-dimethylhydantoin, wherein said inactive
3 ingredient(s) comprise at least a binder or a manufacturing by-product, or both, and wherein
4 said packaging material further comprises a sticker identifying the contents as being an
5 oxidizing agent.

1 24. An article of manufacture comprising a packaging material and a biocidal
2 composition contained within said packaging material, wherein said biocidal composition
3 comprises as an active ingredient of the composition at least at least 95 wt% of one or more
4 1,3-dibromo-5,5-dialkylhydantoins in which one of the alkyl groups in the 5-position is a
5 methyl group and in which the other alkyl group in the 5-position has in the range of 1 to 4
6 carbon atoms, most preferably 1,3-dibromo-5,5-dimethylhydantoin, with the balance, if any,
7 to 100 wt% being inactive ingredient(s), wherein said packaging material comprises a label
8 that indicates that the product can be used as a biocidal agent or disinfectant for use in pools,
9 spas, and/or hot tubs, and wherein said label or another label associated with said packaging
10 material indicates that (1) the level of active bromine should be maintained between 2-4 ppm
11 in residential spas or hot tubs and 3-6 ppm in commercial spas or hot tubs with the pH of the
12 water being adjusted to 7.2-7.6 prior to initiating treatment with the biocidal composition;
13 and/or (2) the level of active bromine should be maintained between 1-4 ppm in swimming
14 pools with the pH of the water being adjusted to 7.2-7.6 prior to initiating treatment with the
15 biocidal composition.

1 25. A method of providing a microbiological control agent for use in treating
2 water, which method comprises purveying an article of manufacture of any of Claims 1, 4, 6,
3 7, 16, 17, 18, 19, 20, 21, 22, 23, or 24.

1 26. An article of manufacture comprising a packaging material and a biocidal
2 composition contained within said packaging material, wherein said biocidal composition
3 consists essentially of a combination of (a) at least one 1,3-dibromo-5,5-dialkylhydantoin in
4 which one of the alkyl groups in the 5-position is a methyl group and the other alkyl group
5 in the 5-position contains in the range of 1 to 4 carbon atoms, and (b) at least one non-fluid
6 biocidally-active water treating agent compatible with said at least one 1,3-dibromo-5,5-
7 dialkylhydantoin, wherein the weight ratio of (a) to (b) is in the range of 0.1:0.4 to 99.9:0.1,
8 and optionally (c) at least one biocidally-inactive ingredient, and wherein said packaging
9 material comprises at least a label suitably identifying the name of the product in the package,
10 and at least a sticker identifying the contents as being an oxidizing agent.

1 27. An article of manufacture of Claim 26 wherein said weight ratio is in the range
2 of 1:1 to 99.9:0.1.

1 28. An article of manufacture of Claim 26 wherein said weight ratio is in the range
2 of 9:1 to 99.9:0.1.

1 29. An article of manufacture of Claim 26 wherein said weight ratio is in the range
2 of 19:1 to 99.9:0.1.

1 30. An article of manufacture of Claim 27 wherein said biocidal composition
2 contained within said packaging material contains at least one biocidally-inactive ingredient
3 which is a binder or a manufacturing by-product, or both, and wherein said label or another
4 label associated with said packaging material indicates hazards associated with the handling
5 and use of the packaged composition.

1 31. An article of manufacture of Claim 30 wherein said label or another label
2 associated with said packaging material indicates that the active ingredient of said biocidal
3 composition contained within said packaging material are the ingredients of (a) and (b)
4 actually contained therein, and wherein said label or another label associated with said
5 packaging material indicates the proportion or percentage of the ingredients of (a) and (b)
6 actually contained in the biocidal composition contained in the packaged composition.

1 32. An article of manufacture of Claim 30 wherein said label or another label
2 associated with said packaging material includes at least one of the following:

- 3 a) description of environmental hazards associated with discharge of the composition
4 into the environment;
- 5 b) description of physical and chemical hazards, and indications of how to avoid or at
6 least reduce such hazards in use;
- 7 c) advice on storage of the product, and on disposal of the product and containers;
- 8 d) advice concerning practical treatment and first aid to be used in the event of contact
9 of the composition with eyes or skin, or if the composition is ingested (swallowed) or
10 inhaled;
- 11 e) directions for use, including but not limited to dosage rates associated with specified
12 use patterns; and
- 13 f) EPA registration number, EPA establishment number, and name and address of the
14 registrant.

1 33. An article of manufacture of Claim 27 wherein (a) is 1,3-dibromo-5-isobutyl-5-
2 methylhydantoin, 1,3-dibromo-5-n-propyl-5-methylhydantoin, or 1,3-dibromo-5-ethyl-5-
3 methylhydantoin, and wherein said at least one biocidally-inactive ingredient comprises a
4 binder or a manufacturing by-product, or both.

1 34. An article of manufacture of Claim 27 wherein (a) is a mixture of at least two
2 of said 1,3-dibromo-5,5-dialkylhydantoins, one of which is 1,3-dibromo-5,5-dimethylhydantoin,
3 and wherein said at least one biocidally-inactive ingredient comprises a binder or a
4 manufacturing by-product, or both.

1 35. An article of manufacture of Claim 27 wherein said at least one 1,3-dibromo-
2 5,5-dialkylhydantoin is a mixture of 1,3-dibromo-5,5-dimethylhydantoin and 1,3-dibromo-5-
3 ethyl-5-methylhydantoin, and wherein said at least one biocidally-inactive ingredient
4 comprises a binder or a manufacturing by-product, or both.

1 36. An article of manufacture of Claims 26, 27, 28, or 29 wherein said at least one
2 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5,5-dimethylhydantoin, and wherein said
3 at least one biocidally-inactive ingredient comprises a binder or a manufacturing by-product,
4 or both.

1 37. An article of manufacture of any of Claims 26, 27, 28, or 29 wherein (b)
2 includes (1) at least one water-soluble biocidally-active N,N'-dihalo-5,5-dialkylhydantoin
3 other than a 1,3-dibromo-5,5-dialkylhydantoin, or (2) at least one water-soluble biocidally-
4 active N-halo-5,5-dialkylhydantoin, or (3) a mixture of (1) and (2).

1 38. An article of manufacture of any of Claims 26, 27, 28, or 29 wherein (b)
2 includes sodium dichloroisocyanurate, trichloroisocyanuric acid, calcium hypochlorite, or
3 lithium hypochlorite, or a mixture of any two or more of the foregoing.

1 39. A method of providing a microbiological control agent for use in treating
2 water, which method comprises purveying an article of manufacture of any of Claims 26, 28,
3 30, 31, 32, 33, 34, or 35.

1 40. A method of providing a microbiological control agent for use in treating
2 water, which method comprises purveying an article of manufacture comprising a packaging
3 material and a biocidal composition contained within said packaging material, wherein said
4 biocidal composition consists essentially of (a) 1,3-dibromo-5,5-dimethylhydantoin; (b) at
5 least one non-fluid biocidally-active water treating agent compatible with 1,3-dibromo-5,5-
6 dimethylhydantoin, wherein the weight ratio of (a) to (b) is in the range of 9:1 to 99.9:0.1; and
7 (c) at least one biocidally-inactive ingredient which comprises a binder or a manufacturing by-
8 product, or both, and wherein said packaging material comprises at least a label suitably
9 identifying the name of the product in the package, and at least a sticker identifying the
10 contents as being an oxidizing agent.